

WHAT IS CLAIMED IS:

1. A magnetic recording/reproducing apparatus using a perpendicular magnetic recording double-layer film medium with a soft underlayer and a reproducing head constituted by a magneto-resistive effect head with a shield film, said apparatus comprising a partial-response equalization circuit having frequency characteristic of cutting off low-frequency signal components inclusive of DC components, and a maximum-likelihood decoder, wherein a reproduced signal outputted from said reproducing head is processed by said partial-response equalization circuit and then inputted into said maximum-likelihood decoder to be data-reproduced.
2. A magnetic recording/reproducing apparatus according to Claim 1, wherein: reproduced signal waveforms corresponding to a pair of closest two recording transitions recorded on said recording medium at a shortest bit-length interval are outputted as signal waveforms having intersymbol interference of an amplitude ratio of  $(a_1, a_2, a_3, \dots, a_k, \dots a_n)$  (in which  $k$  is an integer indicating a bit-interval time, and  $a_1$  and  $a_n$  are non-zero real numbers satisfying the relation:  $a_1 + a_2 + a_3 \dots + a_k + \dots + a_n = 0$ ) at each bit-interval through said partial-response equalization circuit; and said reproduced signal waveforms are inputted into said maximum-likelihood decoder for data reproduction.

3. A magnetic recording/reproducing apparatus according to claim 2, wherein  $a_1$  and  $a_n$  are non-zero real numbers satisfying the relation:  $a_1 + a_2 + a_3 + \dots + a_k + \dots + a_n = 0$ :  $n \geq 5$ ) at each bit-interval through said partial-response equalization circuit.

4. A magnetic recording/reproducing apparatus according to Claim 2, wherein: reproduced signal waveforms corresponding to a pair of the closest two recording transitions recorded on said recording medium at a shortest bit-length interval are outputted as signal waveforms having intersymbol interference of an amplitude ratio of  $(a_1, a_2, a_3-a_1, \dots, a_k-a_{k-2}, \dots, a_n-a_{n-2}, -a_{n-1}, -a_n)$  (in which  $k$  is an integer indicating a bit-interval, and  $a_1$  and  $a_n$  are non-zero real numbers) at each bit-interval through said partial-response equalization circuit; and said reproduced signal waveforms are inputted into said maximum-likelihood decoder for data reproduction.

5. A magnetic recording/reproducing apparatus according to claim 4, wherein  $a_1$  and  $a_n$  are non-zero real numbers satisfying the relation:  $a_1 + a_2 + a_3 + \dots + a_k + \dots + a_n = 0$ :  $n \geq 5$ ) at each bit-interval through said partial-response equalization circuit.

6. A magnetic recording/reproducing apparatus according to Claim 4, wherein  $a_1$ ,  $a_2$  and  $a_3$  take an integer ratio of  $a_1 = 4$ ,  $a_2 = 3$  and  $a_3 = 2$ .

7. A signal processing circuit mounted on a perpendicular magnetic recording/reproducing apparatus

using a perpendicular magnetic recording double-layer film medium with a soft underlayer and a reproducing head constituted by a magneto-resistive effect head with a shield film, said signal processing circuit comprising a partial-response equalization circuit having frequency characteristic of cutting off low-frequency signal components inclusive of DC components, and a maximum-likelihood decoder, wherein a reproduced signal outputted from said reproducing head is processed by said partial-response equalization circuit and then inputted into said maximum-likelihood decoder to be data-reproduced.

8. A signal processing circuit according to Claim 7, wherein: reproduced signal waveforms corresponding to a pair of the closest two recording transitions recorded on said recording medium at a shortest bit-length interval are outputted as signal waveforms having intersymbol interference of an amplitude ratio of  $(a_1, a_2, a_3, \dots, a_k, \dots a_n)$  (in which  $k$  is an integer indicating a bit-interval, and  $a_1$  and  $a_n$  are non-zero real numbers satisfying the relation:  $a_1 + a_2 + a_3 \dots + a_k + \dots + a_n = 0$ ) at each bit-interval time through said partial-response equalization circuit; and said reproduced signal waveforms are inputted into said maximum-likelihood decoder for data reproduction.

9. A signal processing circuit according to Claim 8, wherein: reproduced signal waveforms

corresponding to a pair of the closest two recording transitions recorded on said recording medium at a shortest bit-length interval are outputted as signal waveforms having intersymbol interference of an amplitude ratio of  $(a_1, a_2, a_3-a_1, \dots, a_k-a_{k-2}, \dots, a_n-a_{n-2}, -a_{n-1}, -a_n)$  (in which  $k$  is an integer indicating a bit-interval, and  $a_1$  and  $a_n$  are non-zero real numbers) at each bit-interval through said partial-response equalization circuit; and said reproduced signal waveforms are inputted into said maximum-likelihood decoder for data reproduction.

10. A magnetic recording/reproducing apparatus according to claim 9, wherein  $a_1$  and  $a_n$  are non-zero real numbers satisfying the relation:  $a_1 + a_2 + a_3 \dots + a_k + \dots + a_n = 0$ :  $n \geq 5$ ) at each bit-interval through said partial-response equalization circuit.

11. A signal processing circuit according to Claim 9, wherein  $a_1$ ,  $a_2$  and  $a_3$  take an integer ratio of  $a_1 = 4$ ,  $a_2 = 3$  and  $a_3 = 2$ .

12. A signal processing circuit according to Claim 7, wherein said partial-response equalization circuit is constituted by a transversal filter in which filter tap coefficients are changed or adjusted so that the sum of said tap coefficients is zero.

13. A semiconductor integrated circuit comprising a signal processing circuit according to Claim 7, wherein said signal processing circuit is mounted on said semiconductor integrated circuit.

14. A magnetic recording/reproducing apparatus comprising a semiconductor integrated circuit according to Claim 13, wherein said semiconductor integrated circuit is mounted on said magnetic recording/reproducing apparatus.